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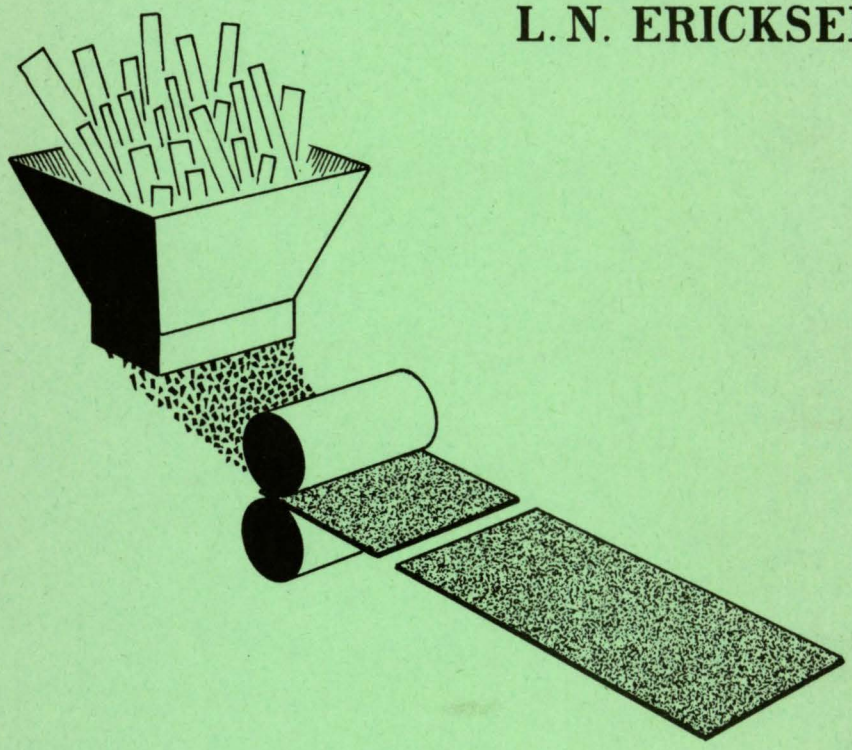

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WOOD RESIDUE FROM PRIMARY WOOD-USING INDUSTRIES IN CALIFORNIA

By

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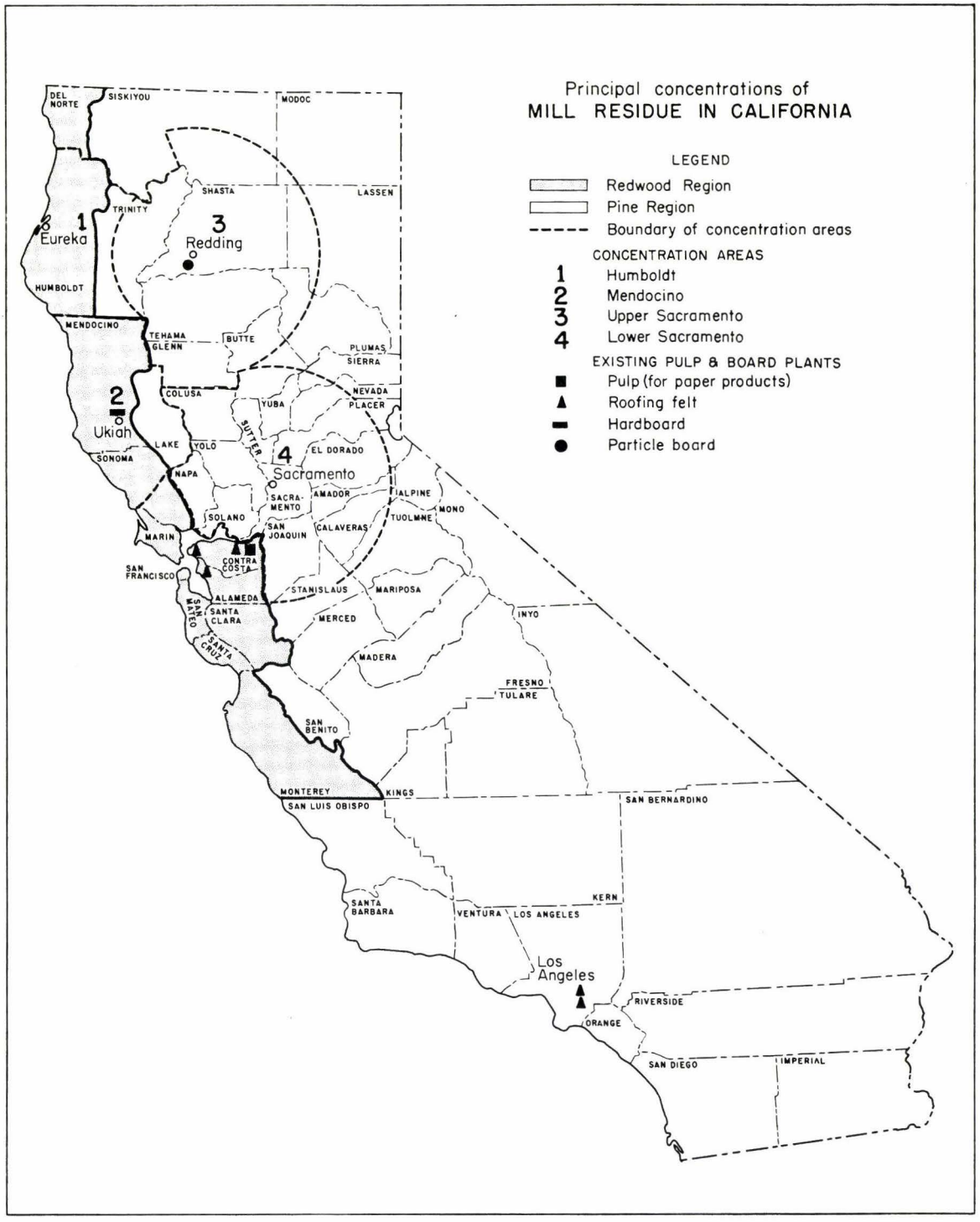
Principal concentrations of
MILL RESIDUE IN CALIFORNIA
LEGEND
Redwood Region
Pine Region
Boundary of concentration areas
CONCENTRATION AREAS
1 Humboldt
2 Mendocino
3 Upper Sacramento
4 Lower Sacramento
EXISTING PULP & BOARD PLANTS
Pulp (for paper products)
Roofing felt
Hardboard
Particle board
DEL NORTE
SISKIYOU
MODOC
SHASTA
LASSEN
TRINITY
1
Eureka
3
Redding
HUMBOLDT
MENDOCINO
TEHAMA
GLENN
BUTTE
PLUMAS
SIERRA
2
Ukiah
COLUSA
YUBA
NEVADA
PLACER
SUTTER
LAKE
YOLO
4
EL DORADO
SONOMA
NAPA
Sacramento
SACRA-
MENTO
AMADOR
ALPINE
MONO
SOLANO
TUOLUMNE
MARIN
SAN
JOAQUIN
CALAVERAS
CONTRA
COSTA
SAN
FRANCISCO
STANISLAUS
MARIPOSA
ALAMEDA
SAN
MATEO
SANTA
CLARA
MERCED
INYO
SANTA
CRUZ
MADERA
FRESNO
TULARE
SAN
BENITO
MONTEREY
KINGS
SAN BERNARDINO
SAN LUIS OBISPO
KERN
SANTA
BARBARA
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Los
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ORANGE
SAN DIEGO
IMPERIAL

WOOD RESIDUE FROM PRIMARY WOOD-USING INDUSTRIES IN CALIFORNIA

Richard H. May and L. N. Ericksen

Wood residues from sawmill and plywood plants in California could support a substantial fiber-processing industry. A survey by the California Forest and Range Experiment Station shows that in 1952 these plants sent more than 160 million cubic feet of slabs, edgings, and other coarse trimmings to waste burners. This amount is equivalent to the annual net growth on 4.8 million acres of California's commercial forest land. It is enough wood to supply ten 250-ton-capacity pulp mills.

Not all of this wood can be used economically. Some is produced in plants with too low a volume, or too isolated, to pay the cost of collecting and transporting the wood to fiber industries. Nevertheless, the survey shows that most of the unused wood is concentrated in four sections of northern California and is strategically located to encourage development of new residue-using industries. They could create new jobs and income without requiring an increased drain on the state's timber resources.

The manufacture of lumber and other primary wood products inevitably results in a large volume of residues--slabs, edgings, trimmings, sawdust, shavings, and other material. In the past much of this residue was used for fuel to produce power, and some was manufactured into lath or other by-products. A large part, however, went to the waste burner. In recent years the increased use of diesel fuel and electric power has resulted in a decline in the proportion of wood residue used for fuel. Production of lath has declined greatly since 1941. These declines are being offset by increased use of wood residues for fiber, particularly in western pulp mills. Many sawmills and plywood plants convert their wood residues to chips for sale to pulp or fiber-board plants.

In California use of wood residue for pulp is a comparatively recent development. Roofing-felt manufacturers here have used wood fiber in composition roofing for many years, but the total volume used annually was small. In 1944, for example, only 11,000 cords were used. In 1948 a pulp mill of 250-tons-per-day capacity was built at Antioch, and in 1950 a hardboard plant of about 150 tons capacity was completed at Ukiah. The companies operating these plants originally planned to use low-grade logs, logging residue, and forest thinnings as their main source of material. But within the past few years they have been using increasingly greater volumes of residues from wood manufacturing plants. Total wood used for pulping in California in 1952 was equivalent to 311,000 cords. One-third of this was mill residue. Since 1952 an even greater part of the state's pulpwood requirements has come from chipped mill residues, but the amount consumed is still small compared to chip consumption in Washington and Oregon.

As the market for wood residue increased, a need has developed for more accurate information on the volume, kind, and source of residues from primary wood-using industries. A survey to obtain this information for California was made by the California Forest and Range Experiment Station in 1953, as a part of the nation-wide Timber Resource Review. The results of this survey, which covered the year 1952, are presented in this report.

A considerable volume of wood residue is produced in secondary wood manufacturing plants, such as planing mills separate from sawmills, moulding plants, flooring mills, furniture factories, and box mills. These were not covered in this survey. Los Angeles is the main center for these secondary plants, which ship some of their residue to pulp mills and roofing plants.

SURVEY RESULTS

The survey showed that about 370 million cubic feet of residue material were derived in primary forest products plants in California in 1952. This was about equally divided between the Pine and Redwood regions. Coarse residue (slabs, edgings, trimmings, veneer clippings, and veneer cores) amounted to 242 million cubic feet, or 65 percent of the total; and fine residue (sawdust and shavings) accounted for the remaining 129 million cubic feet, or 35 percent (fig. 1 and table 1). These volumes are in solid wood equivalent and do not include bark.

Thirty-eight percent (143 million cubic feet) of the wood residue was used (table 2). The remaining 62 percent was unused, and was largely disposed of in waste burners. About a third of the coarse residue was used and half of the fine residue.

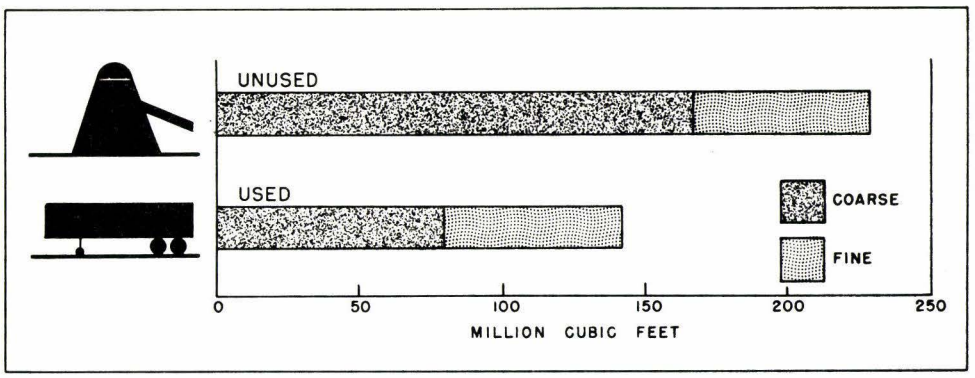


Figure 1.--Residue produced at primary wood-using plants, California, 1952.

The greatest use of residue was for fuel--86 percent of the volume used (fig. 2). The fuel went principally to generate power for plant use. Equal volumes of coarse and fine residues were used for fuel. Six percent was chipped for fiber use, but only the coarse residue was employed for this purpose. The fiber went into paper pulp, hardboard, and roofing felt.

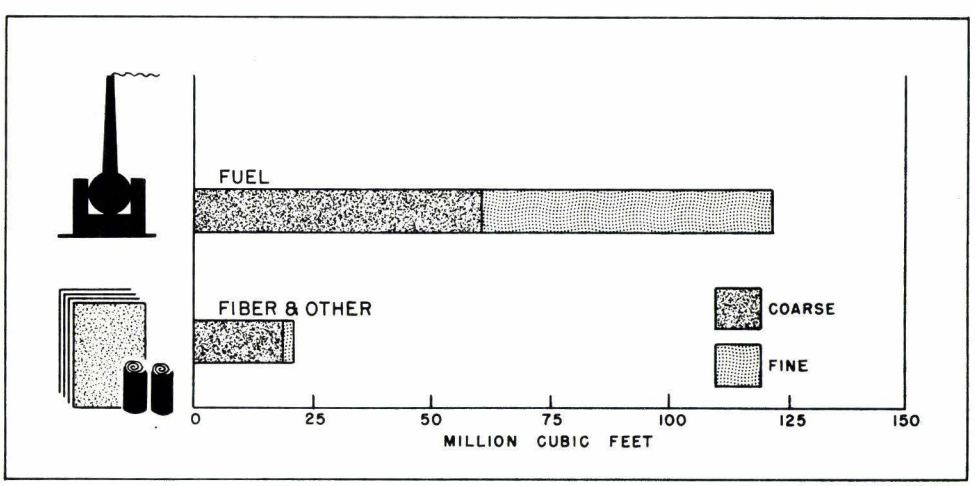


Figure 2.--Uses of wood residues, California, 1952.

Miscellaneous other products accounted for 8 percent of the volume used, taking primarily coarse material. Some coarse residues went into such varied products as lath, moulding, shade rollers, toy stock, and mine-timber blocking. Cores from veneer bolts were sawed into lumber, mainly studs. Also, veneer cores and clippings were manufactured into particle board. Fine residues were sold for livestock bedding, soil conditioning, sawdust for packing purposes, and for resale.

Sawmills were the source of 97 percent of the residues developed in the State. Veneer plants furnished most of the remainder. Large mills[1/] produced 40 percent of the total volume of the sawmill residues, and medium and small mills about equally divided the remainder (fig. 3). Seventy percent of the residue produced by the large mills was used, as compared with 24 percent for medium mills and 7 percent for small mills.

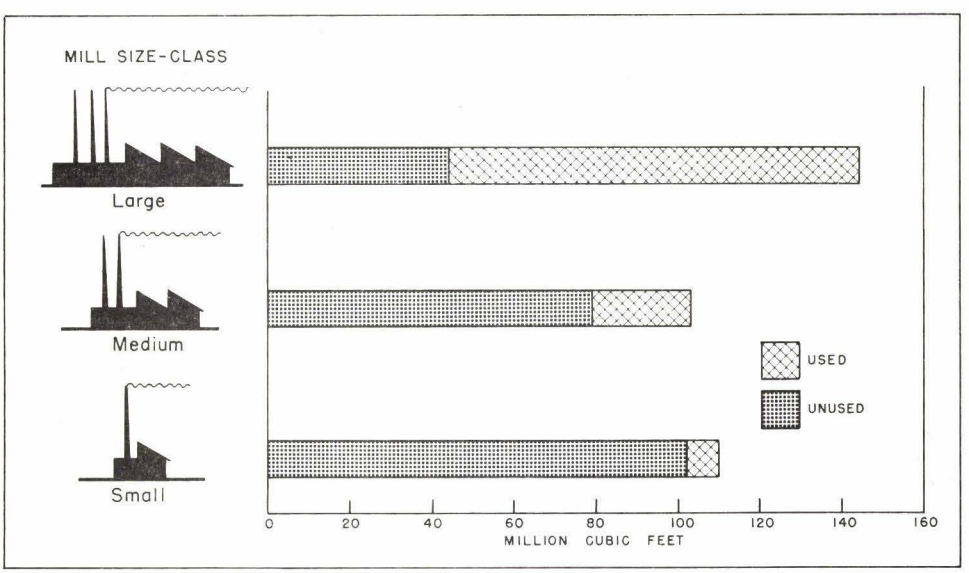
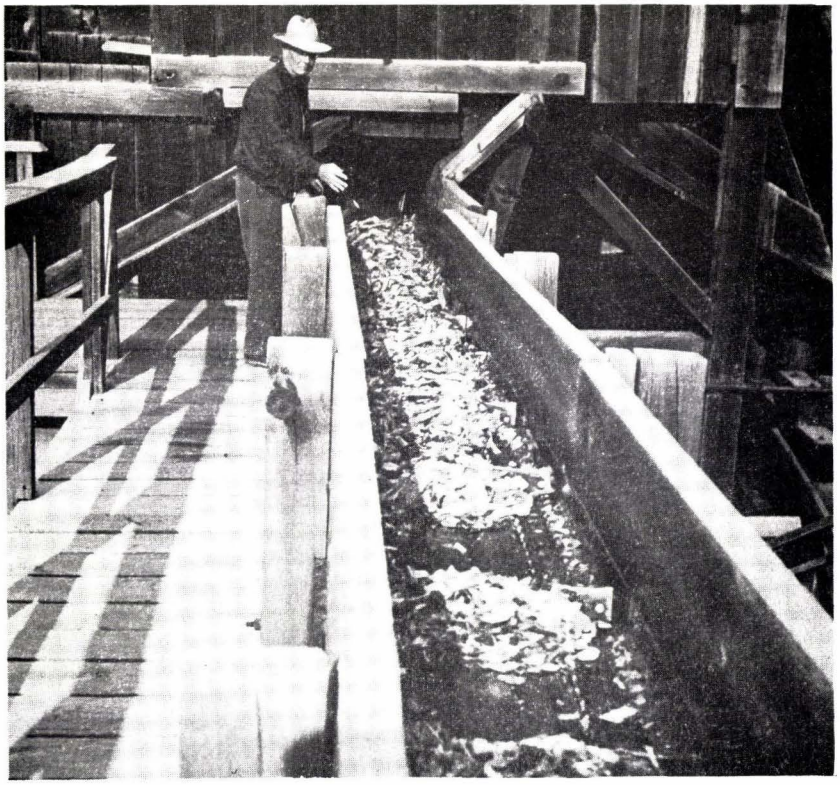
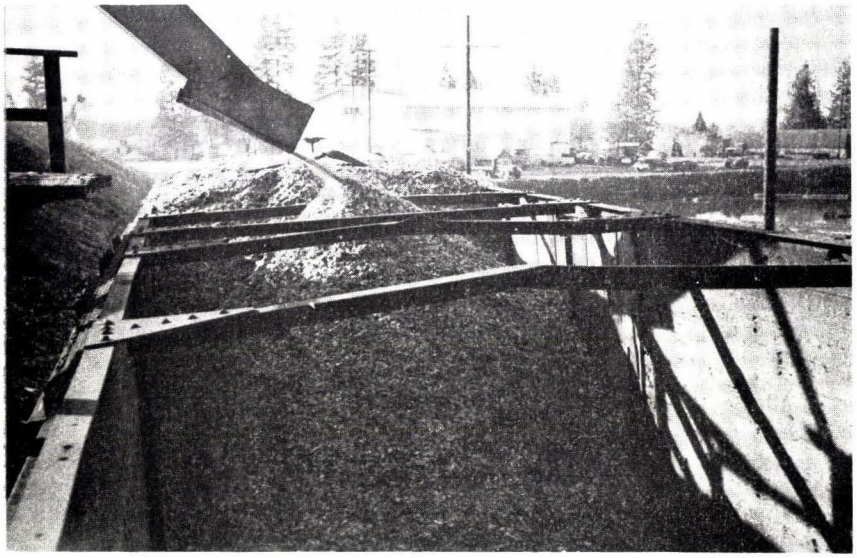


Figure 3.--Production and use of wood residues, by size of sawmill, California, 1952.

1/ Sawmill size classes are defined as follows: Large - mills producing 25.0 and more million board-feet of lumber annually. Medium - mills producing 10.0 to 24.9 million board-feet of lumber annually. Small - mills producing 9.9 and less million board-feet of lumber annually.



Transferring chips from sawmill chipper for loading in railroad cars or trucks.



Loading car of chips at sawmill for shipment to pulpmill.

The greater use of residue from large mills was chiefly due to fuel use, because these mills included most of those burning wood to produce steam for power. One advantage of the large mills as a source of raw material is that they have a greater volume and concentration of available residue than other mills. In the aggregate small sawmills produce the greatest volume of unused residue, but they are scattered and their individual production is small, so that collecting their residue may be more costly than collecting from the large mills.

PRINCIPAL CONCENTRATION AREAS

Primary wood-using industries are scattered over much of northern California. Four areas, however, have a concentration of mills and a transportation network that offer good possibilities for development of secondary industries using wood residue. These areas (see map preceding page 1) are:

(1) The Humboldt area, consisting of Humboldt and western Trinity Counties;

(2) The Mendocino area, consisting of Mendocino, Lake, and northern Sonoma Counties;

(3) The upper Sacramento Valley, within a 75-mile radius from Redding; and

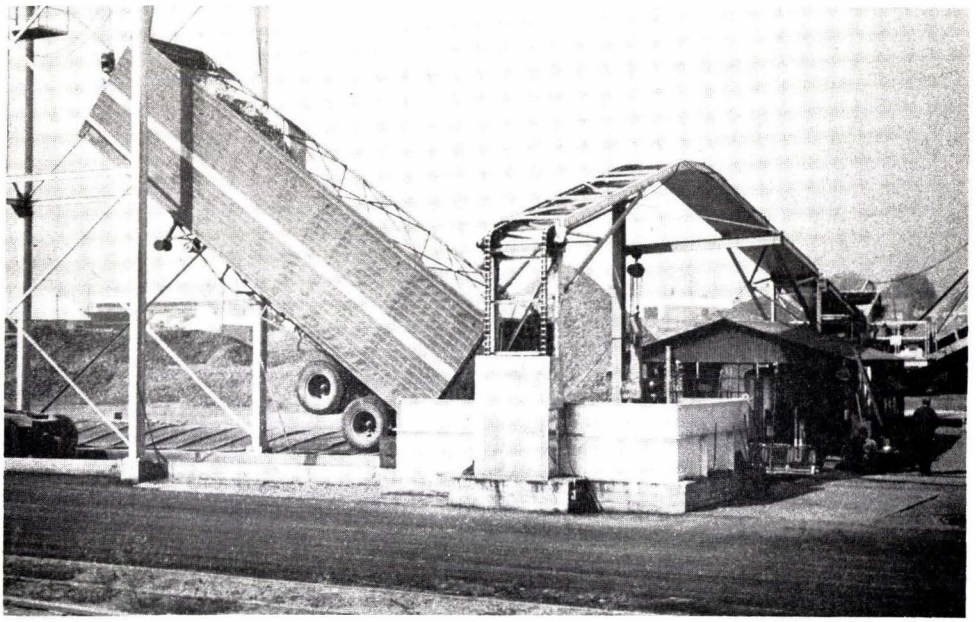
(4) The lower Sacramento Valley, within a 75-mile radius from Sacramento.

The mills in these areas together produced 78 percent of the total millwood residue in the State.

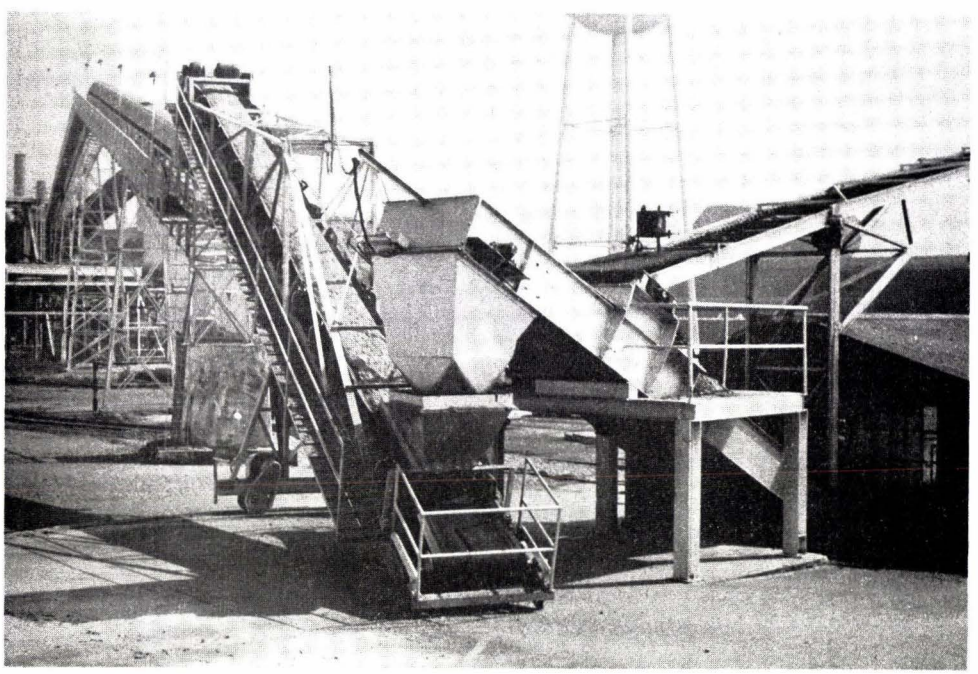
Nearly one-third of the total residue produced in California was developed in the Humboldt area, and about one-sixth came from each of the other three principal areas (fig. 4 and table 3). Use of residue was proportionately the greatest in the two Sacramento Valley areas, where nearly half the total volume produced was used, chiefly for fuel (table 4).

About one-third of the coarse residue in all four areas combined was used. The greatest use (44 percent) was in the lower Sacramento Valley, and the least (24 percent) in the Mendocino area.

The Humboldt area was the greatest producer of chips for fiber. Even here the 2.9 million cubic feet of coarse material used for fiber was only 4 percent of the total volume of coarse residue produced, and only 14 percent of the volume used.



Dumping chips from trailer into pit at fiber-using plant. Chips may go direct to mill or to storage piles in background.



Chip handling by conveyors, from pit to movable transfer section, then either to plant as shown or to storage piles.

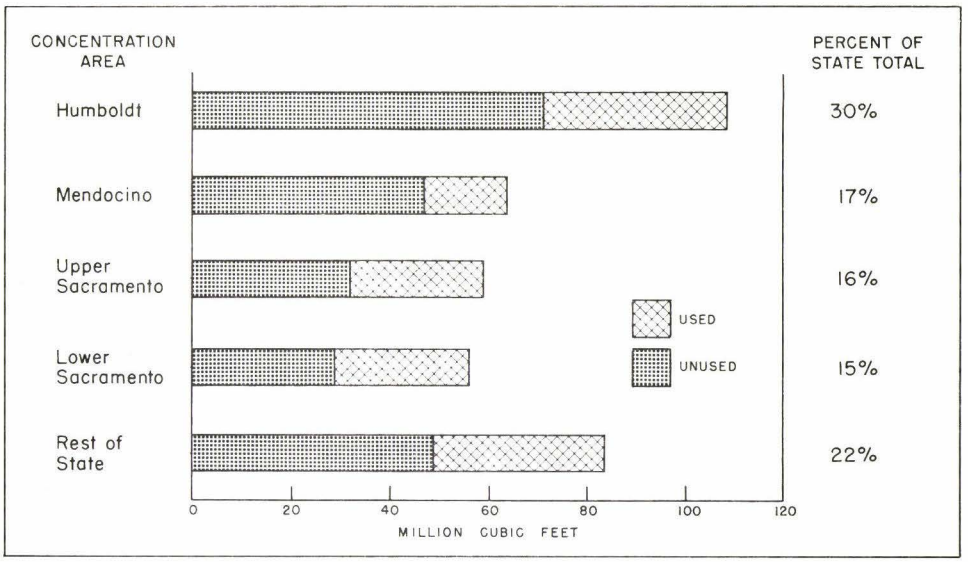


Figure 4.--Production and use of wood residue by areas of concentration, California, 1952.

The large volume of unused residue, especially coarse material, in the four principal areas of concentration, offers opportunity for a great expansion in fiber utilization. Wood residues for fuel will probably continue to give ground to petroleum products and electricity. Agricultural and miscellaneous uses may be expected to expand but will probably not consume a large share of the total volume of residue. The use of coarse residue for fiber, however, seems limited only by the availability of a market within economical distance once the problems of water supply and pollution are overcome. Solving the water problems in a manner compatible with other water-use requirements is recognized as a major factor in wood-fiber utilization. Where an industrial demand for fiber has existed, as in Washington and Oregon, the volume of mill residue chips used by pulp and hardboard plants has increased markedly since World War II.

The 48 million cubic feet (530,000 cords equivalent) of unused coarse residue in the Humboldt County area alone could supply 3 pulp mills each of 250 tons daily capacity. The 162 million cubic feet of unused coarse residue in the entire State could produce 900,000 tons of pulp annually if fully utilized.

By more complete and effective utilization of mill residues, wood-processing industries could be greatly expanded, and employment, income, and community stability increased without additional drain on the standing timber in California.

PROCEDURE AND ACCURACY

Basis of Estimate

Survey forms were mailed to all primary wood-using plants of record in California--sawmills, plywood and veneer plants, shingle and shake mills, and cooperage plants. The forms requested information for 1952 on quantity of logs consumed, the volume of coarse and fine residue produced, and the percentage of residue used by type of use.

Information was received from 191 sawmills representing 54 percent of total 1952 production. By size classes, returns represented 78 percent of production by large mills, 63 percent by medium mills, and 22 percent by small mills.2/ In the veneer and plywood industry, returns from 17 plants represented 73 percent of total log consumption. For sawmills and veneer plants combined, the mills replying accounted for 56 percent of total log consumption.

Residue Factors

Sawmills

The reported volumes of residue developed at sawmills were extremely variable. A number of companies omitted these figures entirely, and some indicated that the figures shown were "guesses." Apparently, few operators had any information on which to base an estimate. Therefore, residue volumes produced in lumber manufacture were estimated from the results of 15 mill-scale studies made by the U. S. Forest Service in California.

These studies showed that the end products of pine and fir logs on a cubic volume basis were as follows:

Dressed lumber	47 percent
Residue	53 percent
Slabs, edgings, trim	29 percent
Sawdust	12 percent
Shavings	12 percent

2/ See footnote 1, page 4, for definitions of mill-size classes.

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Corresponding figures for redwood were:

Dressed lumber	37 percent
Residue	63 percent
Slabs, edgings, trim	41 percent
Sawdust	13 percent
Shavings	9 percent

These percentages were applied to each reporting company's figure of log consumption. Adjustment was made for lack of shavings at mills cutting rough lumber only. This procedure gave an estimated volume of residue per plant.

The percentages of use or non-use reported by each company were then applied to the estimate of total residue for each plant to give estimates of volume of residue used or not used for each plant. These volumes were totalled to give volumes of residue for the reporting plants by strata based on mill-size, class of residue, and region.

Total volumes of residue for all strata were then expanded on the basis of the ratio between the reported 1952 lumber production of the reporting plants in a stratum and the 1952 lumber production of all plants in the same stratum.

Veneer and Plywood Plants

Volumes of residues reported by veneer and plywood plants were extremely variable; some plants did not report. The volumes of residue developed were therefore computed from factors derived from other sources. From industry figures on the ratio between plywood and log volumes, and from information on veneer and plywood yields, it was estimated that the plywood yield was 61 percent of the cubic volume of logs. The remaining 39 percent was divided into cores and solid wood 8 percent, veneer waste 25 percent, and sander dust 6 percent.

The disposition of plant residues was computed from information shown on returns from individual veneer and plywood plants. The residue volumes computed for the reporting plants were expanded to an estimated total for all plants by applying the ratio between production of reporting plants and production of all plants.

Other Industries

Returns were received from the one cooperage plant in California and from 14 of the 36 active shingle and shake plants.

Volumes of residue produced by these industries were based on earlier studies, and the proportions used were derived from their 1952 reports.

Estimates of residues produced at pulp mills were compiled in the Washington office of the Forest Service. Such residues consist only of wood losses in storage and in preparing wood for pulping.

Accuracy

The sampling error of the total volume of residue could not readily be computed. But the sampling error of the percentage of residue used in relation to total volume produced was computed as 6 percent (within one standard deviation) for the sawmill industry and 11 percent for the plywood-veneer industry. The sampling error of this ratio for these industries combined was 5.5 percent. These two segments of industry represent 97 percent of the total log consumption by primary wood-using plants in the State, and produce 99 percent of the total residues.

Other types of error were more important than sampling error in this survey. These include, first, errors in the factors for volume of residue per unit of production. These factors were based on earlier mill-scale studies, but several independent checks indicated these mill-scale studies to be reliable in 1952. Another possible source of error is the company estimates of percentage of residue used. We believe the final results are reasonably close to a true figure.

Table 1.--Estimated volume of residues from primary wood-using plants by kind of plant, region, and utilization, California, 1952

Origin by kind of plant and region	Used			Unused			All residue			
	Coarse	Fine	Total	Coarse	Fine	Total	Coarse	Fine	Total Vol.	Total Pct.
	Million cubic feet[1/]									
Sawmills[2/]										
Pine region	42.1	38.3	80.4	72.5	27.8	100.3	114.6	66.1	180.7	49
Redwood region	29.7	23.2	52.9	86.6	37.6	124.2	116.3	60.8	177.1	48
Total	71.8	61.5	133.3	159.1	65.4	224.5	230.9	126.9	357.8	97
Veneer plants[3/]										
Pine region	2.6	0.3	2.9	0.3	(4/)	0.3	2.9	0.3	3.2	1
Redwood region	5.2	0.9	6.1	2.8	0.2	3.0	8.0	1.1	9.1	2
Total	7.8	1.2	9.0	3.1	0.2	3.3	10.9	1.4	12.3	3
Other plants[5/]										
Pine region	(4/)	(4/)	(4/)	(4/)	(4/)	(4/)	(4/)	(4/)	(4/)	(4/)
Redwood region	0.4	0.8	1.2	0.1	0.2	3.3	0.5	1.0	1.5	-
All plants										
Pine region	44.7	38.6	83.3	72.8	27.8	100.6	117.5	66.4	183.9	50
Redwood region	35.3	24.9	60.2	89.5	38.0	127.5	124.8	62.9	187.7	50
Total Volume	80.0	63.5	143.5	162.3	65.8	228.1	242.3	129.3	371.6	-
Pct. of total	21	17	38	44	18	62	65	35	-	100

1/ Solid wood equivalent.
2/ Sawmills and integrated planing mills.
3/ Veneer plants, including integrated plywood plants.
4/ = less than 50,000 cubic feet.
5/ Shingle (including sawn shake), pulp and cooperage plants.

Table 2.--Wood residue used by originating plant, region, and type of use, California, 1952

Origin by kind of plant and region	Used for fuel			Used for fiber			Used for other[1]			All uses			
	Coarse	Fine	Total	Coarse	Fine	Total	Coarse	Fine	Total	Coarse	Fine	Total Vol.	Total Pct.
	Million cubic feet[2]												
Sawmills													
Pine region	35.7	37.8	73.5	1.6	--	1.6	4.8	0.5	5.3	42.1	38.3	80.4	57
Redwood region	21.2	22.2	43.4	5.2	--	5.2	3.3	1.0	4.3	29.7	23.2	52.9	37
Total	56.9	60.0	116.9	6.8	--	6.8	8.1	1.5	9.6	71.8	61.5	133.3	94
Veneer plants													
Pine region	1.4	0.2	1.6	0.2	--	0.2	1.0	0.1	1.1	2.6	0.3	2.9	2
Redwood region	2.9	0.8	3.7	1.0	--	1.0	1.3	0.1	1.4	5.2	0.9	6.1	4
Total	4.3	1.0	5.3	1.2	--	1.2	2.3	0.2	2.5	7.8	1.2	9.0	6
Other plants[3]													
Pine region	(4)	--	(4)	--	--	--	--	(4)	(4)	(4)	(4)	(4)	--
Redwood region	0.4	0.7	1.1	--	--	--	--	0.1	0.1	0.4	0.8	1.2	--
Total	0.4	0.7	1.1	--	--	--	--	0.1	0.1	0.4	0.8	1.2	--
All plants													
Pine region	37.1	38.0	75.1	1.8	--	1.8	5.8	0.6	6.4	44.7	38.6	83.3	59
Redwood region	24.5	23.7	48.2	6.2	--	6.2	4.6	1.2	5.8	34.9	24.4	59.3	41
Total used Volume	61.6	61.7	123.3	8.0	--	8.0	10.4	1.8	12.2	80.0	63.5	143.5	
Percent	43	43	86	6	--	6	7	1	8	56	44	--	100

1/ Agricultural and miscellaneous uses.
2/ Solid wood equivalent.
3/ Cooperage, pulp, and shingle mills.
4/ Less than 50,000 cubic feet.

Table 3.--Estimated volume of residue from primary wood-using plants in four major concentration areas of California, 1952

Origin by area and kind of plant	Used			Unused			All residue		
	Coarse	Fine	Total	Coarse	Fine	Total	Coarse	Fine	Total
	Million cubic feet[1/]								
Humboldt Area									
Lumber	17.0	16.3	33.3	47.4	23.1	70.5	64.4	34.4	103.8
Veneer	3.8	0.4	4.2	0.5	0.1	0.6	4.3	0.5	4.8
Other	(2/)	0.4	0.4	0.1	0.1	0.2	0.1	0.5	0.6
Total	20.8	17.1	37.9	48.0	23.3	71.3	68.8	40.4	109.2
Mendocino Area									
Lumber	8.9	7.0	15.9	29.7	16.7	46.4	38.6	23.7	62.3
Veneer	0.8	0.1	0.9	0.6	(2/)	0.6	1.4	0.1	1.5
Other	(2/)	0.2	0.2	(2/)	0.1	0.1	(2/)	0.3	0.3
Total	9.7	7.3	17.0	30.3	16.8	47.1	40.0	24.1	64.1
Upper Sacramento Valley									
Lumber	11.4	13.4	24.8	24.6	7.6	32.2	36.0	21.0	57.0
Veneer	1.8	0.2	2.0	(2/)	(2/)	(2/)	1.8	0.2	2.0
Total	13.2	13.6	26.8	24.6	7.6	32.2	37.8	21.2	59.0
Lower Sacramento Valley									
Lumber	15.8	10.7	26.5	19.7	9.3	29.0	35.5	20.0	55.5
Veneer	0.1	(2/)	0.1	0.1	(2/)	0.1	0.2	(2/)	0.2
Total	15.9	10.7	26.6	19.8	9.3	29.1	35.7	20.0	55.7
Rest of State	20.4	14.8	35.2	39.6	8.8	48.4	60.0	23.6	83.6
Total	80.0	63.5	143.5	162.3	65.8	228.1	242.3	129.3	371.6

1/ Solid wood equivalent.
2/ Less than 50,000 cubic feet.

Table 4.--Wood residue used, by originating areas, kind of originating plant and type of use, California, 1952

Origin by area and kind of plant	Used for fuel			Used for fiber			Other[1]			All used		
	Coarse	Fine	Total	Coarse	Fine	Total	Coarse	Fine	Total	Coarse	Fine	Total
	Million cubic feet[2]											
Humboldt Area												
Lumber	14.0	15.4	29.4	2.3	--	2.3	0.7	0.9	1.6	17.0	16.3	33.3
Veneer	2.5	0.3	2.8	0.6	--	0.6	0.7	0.1	0.8	3.8	0.4	4.2
Other[3]	(4/)	0.3	0.3	--	--	--	--	0.1	0.1	(4/)	0.4	0.4
Total	16.5	16.0	32.5	2.9	--	2.9	1.4	1.1	2.5	20.8	17.1	37.9
Mendocino Area												
Lumber	6.0	6.9	12.9	1.7	--	1.7	1.2	0.1	1.3	8.9	7.0	15.9
Veneer	0.2	0.1	0.3	0.2	--	0.2	0.4	--	0.4	0.8	0.1	0.9
Other[3]	(4/)	0.2	0.2	--	--	--	--	(4/)	(4/)	(4/)	0.2	0.2
Total	6.2	7.2	13.4	1.9	--	1.9	1.6	0.1	1.7	9.7	7.3	17.0
Upper Sacramento Valley												
Lumber	9.6	13.4	23.0	0.6	--	0.6	1.2	(4/)	1.2	11.4	13.4	24.8
Veneer	0.6	0.1	0.7	0.2	--	0.2	1.0	0.1	1.1	1.8	0.2	2.0
Total	10.2	13.5	23.7	0.8	--	0.8	2.2	0.1	2.3	13.2	13.6	26.8
Lower Sacramento Valley												
Lumber	11.9	10.7	22.6	0.6	--	0.6	3.3	(4/)	3.3	15.8	10.7	26.5
Veneer	0.1	(4/)	0.1	--	--	--	(4/)	--	(4/)	0.1	(4/)	0.1
Volume	12.0	10.7	22.7	0.6	--	0.6	3.3	(4/)	3.3	15.9	10.7	26.6

1/ Agricultural and miscellaneous.
2/ Solid wood equivalent.
3/ Cooperage, shingle, and pulp.
4/ Less than 50,000 cubic feet.

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